Complete Summary

GUIDELINE TITLE

Metastatic bone disease.

BIBLIOGRAPHIC SOURCE(S)

El-Khoury GY, Bennett DL, Dalinka MK, Daffner RH, DeSmet AA, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Metastatic bone disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 11 p. [40 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: el-Khoury GY, Dalinka MK, Alazraki N, Berquist TH, Daffner RH, DeSmet AA, Goergen TG, Keats TE, Manaster BJ, Newberg A, Pavlov H, Haralson RH, McCabe JB, Sartoris D. Metastatic bone disease. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):283-93.

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Metastatic bone disease

GUIDELINE CATEGORY

Diagnosis
Evaluation

CLINICAL SPECIALTY

Internal Medicine
Nuclear Medicine
Oncology
Radiology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for metastatic bone disease

TARGET POPULATION

Patients with metastatic bone disease

INTERVENTIONS AND PRACTICES CONSIDERED

1. Whole-body radiographic survey
2. Radiography of the spine, lumbar spine, back, hip, hot areas, sternum, femur
3. Ultrasound of whole body, spine, sternum, femur, chest, lumbar spine
4. Whole-body tomography
5. Computed tomography (CT) myelography of whole body, spine
6. Computed tomography of whole body, back, hip, spine, sternum, femur, chest, lumbar spine
7. Magnetic resonance imaging (MRI) of whole body, spine, sternum, femur, chest, lumbar spine
8. MRI with contrast
9. Fine needle aspiration
10. Core biopsy
11. Myelography of spine, sternum, lumbar spine
12. Nuclear medicine (NUC), radionuclide bone scan
13. NUC, single photon emission computed tomography of back, hip, spine, femur
14. Whole-body fast short tau inversion recovery (STIR) MRI

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of peer-reviewed medical journals, and the major applicable articles were identified and collected.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed for reaching agreement in the formulation of the appropriateness criteria. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table

and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1 to 9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty (80) percent agreement is considered a consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by this Delphi technique, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Committee on Appropriateness Criteria.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Metastatic Bone Disease

Variant 1: Stage 1 carcinoma of the breast. Initial presentation: asymptomatic.

Radiologic Exam Procedure	Appropriateness Rating	Comments

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, radiographic survey, whole body	1	
US, whole body	1	
Tomography, whole body	1	
CT myelography, whole body	1	
MRI, whole body	1	
MRI, whole body, with contrast	1	
Aspiration, whole body, fine needle	1	
Biopsy, whole body, core	1	
Myelography, whole body	1	
NUC, bone scan	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Stage 2 carcinoma of the breast. Initial presentation, with back and hip pain.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, back	9	
X-ray, hip	9	
NUC, bone scan	9	
X-ray, radiographic survey	1	
CT, hip and back	1	

Radiologic Exam Procedure	Appropriateness Rating	Comments
US	1	
CT, back	1	
CT, hip	1	
CT myelography	1	
NUC, back, SPECT	1	
NUC, hip, SPECT	1	
MRI, with contrast	1	
Myelography	1	
MRI	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Breast carcinoma. Follow-up bone scan reveals single hot lesion in spine.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, spine	9	If radiograph is negative.
X-ray, spine, hot area	9	
US, spine	1	
CT myelography, spine	1	
MRI, spine, with contrast	1	
Aspiration, spine, fine needle	1	
Biopsy, spine, core	1	
Myelography, spine	1	
X-ray, radiographic survey	1	

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT, spine	1	May be needed for biopsy localization.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Breast carcinoma. Three hot areas in spine (bone scan). No back pain.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, spine, hot area	9	
MRI, spine	9	If radiographs are negative.
Tomography, spine	1	
X-ray, radiographic survey	1	
US, spine	1	
CT myelography, spine	1	
NUC, spine, SPECT	1	SPECT added to bone scan in equivocal lesions.
MRI, spine, with contrast	1	
Aspiration, spine, fine needle	1	
Biopsy, spine, core	1	
Myelography, spine	1	
CT, spine, hot areas	1	Necessary if biopsy is to be performed.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: History of treated breast carcinoma. Now has single hot lesion in sternum.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, sternum	9	
CT, sternum	9	Important for diagnosis and for use in localization if biopsy is required.
X-ray, radiographic survey	1	
Tomography, sternum	1	
US, sternum	1	
MRI, sternum	1	
MRI, sternum, with contrast	1	
Myelography, sternum	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Patient with known bone metastatic disease (carcinoma of the breast). Presenting with pathological fracture of left femur on radiography.

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, bone scan	9	
X-ray, radiographic survey	1	
X-ray, femur	1	
US, femur	1	
CT, femur	1	
MRI, femur	1	
MRI, femur, with	1	

Radiologic Exam Procedure	Appropriateness Rating	Comments
contrast		
Aspiration, femur, fine needle	1	
Biopsy, femur, core	1	
NUC, femur, SPECT	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 7: Prostate nodule on physical exam, proven to be a well- or moderately differentiated carcinoma and PSA < 20 mg/mL. Patient asymptomatic.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, radiographic survey	1	
US	1	
CT	1	
MRI	1	
MRI with contrast	1	
Myelography	1	
NUC, bone scan	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 8: Prostate nodule on physical exam, proven to be a poorly differentiated carcinoma or PSA ≥ 20 mg/mL. Patient asymptomatic.

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, bone scan	9	
X-ray, radiographic survey	1	
US	1	
CT	1	
MRI	1	
MRI, with contrast	1	
Myelography	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 9: Elderly patient with known malignancy, with back pain and partially collapsed vertebra on radiography. Otherwise healthy.

Radiologic Exam Procedure	Appropriateness Rating	Comments
MRI, spine	9	To differentiate osteoporotic collapse from destructive lesion.
NUC, bone scan	8	To look for other lesions and to locate biopsy location.
X-ray, radiographic survey	1	
X-ray, spine	1	
US, spine	1	
MRI, spine, with contrast	1	
Biopsy, spine, core	1	
Myelography, spine	1	
CT, spine	1	May be used for biopsy localization.
Appropriateness Criteria Scale		

Radiologic Exam Procedure	Appropriateness Rating	Comments
1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 10: 1 cm lung nodule. Non-small cell at needle biopsy. Now coming for staging and resection.

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, bone scan	9	
X-ray, radiographic survey	1	
US, chest	1	
CT, chest	1	
MRI, chest	1	
MRI, chest, with contrast	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 11: Patient with multiple myeloma presenting with acute low back pain.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray, lumbar spine	9	
MRI, lumbar spine	8	To see characteristics of lesion and adjacent marrow.
X-ray, radiographic survey	2	Would do AP and lateral lumbar spine rather than metastatic bone survey.
US, lumbar spine	1	

Radiologic Exam Procedure	Appropriateness Rating	Comments
CT, lumbar spine	1	
NUC, bone scan	1	SPECT added to bone scan in equivocal lesions. Indicated if strontium (Sr89) treatment is indicated.
MRI, lumbar spine, with contrast	1	
Myelography, lumbar spine	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 12: Young patient with osteosarcoma of long bone coming for staging. Chest CT normal. Looking for bone metastases.

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, bone scan	9	
X-ray, radiographic survey	1	
US	1	
CT	1	
NUC, bone scan, SPECT	1	SPECT added to nuclear medicine in equivocal lesions.
MRI	1	
MRI with contrast	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 13: Osteosarcoma, resected clear margins. Chemotherapy, asymptomatic. Six-month follow-up after treatment to rule out bone metastases.

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, bone scan	9	
X-ray, radiographic survey	1	
US	1	
CT	1	
NUC, bone scan, SPECT	1	
MRI	1	
MRI with contrast	1	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 14: Elderly female with known primary, now presenting with acute vertebral collapse by radiograph and CT.

Radiologic Exam Procedure	Appropriateness Rating	Comments
NUC, bone scan	9	
MRI	9	
X-ray, radiographic survey	2	
MRI with contrast	2	
Myelography	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 15: Female, 8 weeks pregnant, with known primary, now suspected of having bone metastasis. She wants to continue with the pregnancy.

Radiologic Exam Procedure	Appropriateness Rating	Comments
X-ray	9	
MRI, whole-body fast STIR	9	
CT	2	
NUC, bone scan	2	
X-ray, radiographic survey	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

There are several imaging and interventional techniques for the initial detection and follow-up of metastatic bone disease: radiography, radionuclide bone scanning, computed tomography (CT), magnetic resonance imaging (MRI), fine needle aspiration, and core needle biopsy. Recently other techniques have been tested. These include: 18F fluoro-D-glucose positron emission tomography (18FDG PET), 18F fluoro-D-glucose positron emission tomography/computed tomography (18FDG PET/CT), and whole body MRI using a rolling table platform.

Except for a few limitations, radionuclide bone scanning remains the primary imaging examination used to detect osseous metastasis. It has been repeatedly shown to be more sensitive than plain radiography. Bone scans are sensitive in detecting osseous abnormalities, but they are nonspecific. After an abnormality has been detected, it should be radiographed to make sure it does not represent a benign process such as osteoarthritis, inflammatory arthritis or fracture. One of the major advantages of radionuclide bone scanning is that it allows for a total body survey. This is important because approximately 13% of metastatic lesions occur in the appendicular skeleton in regions that are usually not included on a skeletal survey. One study pointed out that the most metastatic skeletal lesions could be asymptomatic and the serum alkaline phosphatase level is a poor indicator of early metastases. Highly aggressive metastases may show "cold" or photopenic areas on a bone scan. Multiple myeloma can frequently show photopenic lesions or a negative bone scan. Bone scans are also insensitive in the detection of skeletal lesions due to Langerhans cell histiocytosis (histiocytosis X), and radiographic surveys are recommended for patients with this disease. Diffuse bony metastasis may present with a pattern of intense uniform radionuclide uptake (superscan), which can be misinterpreted as a negative examination.

Solitary sites of increased radionuclide uptake in patients with known malignancy are a common occurrence, and they could pose a diagnostic problem because of the nonspecific nature of these abnormalities on bone scintigraphy. On the other hand, one study reported that approximately 21% of patients with breast cancer relapsed with a solitary bone lesion, most commonly in the spine. The spine was the most common site for both solitary and multiple metastases. Another study reported that a solitary rib metastasis in cancer patients are uncommon and that 90% of hot rib lesions on bone scan are due to benign causes. A solitary sternal hot lesion in a patient with breast carcinoma has an 80% probability of being due to metastatic disease. When a patient with a known primary tumor develops a solitary lesion on a bone scan, further diagnostic evaluation should be undertaken, starting with radiography and, if not diagnostic, proceeding to CT, MRI, or even biopsy. Some authors advocate single photon emission computed tomography (SPECT) imaging as an effective method for differentiating malignant from benign lesions in the spine.

In stage 1 breast carcinoma where bone scintigraphy is usually negative, most authorities believe that routine baseline and follow-up bone scans are probably unwarranted because of the very low true positive yield. The panel does not recommend any imaging studies of the skeleton in patients with stage 1 carcinoma of the breast when they present initially. Bone scanning is useful in the preoperative staging and postoperative follow-up of stages 2, 3, and 4 breast carcinoma. If a patient with stage 2 breast carcinoma presents with back and hip pain, the panel recommends radiography of the back and hip and radionuclide bone scan. Other studies may be needed depending on the results of the radiographs and bone scan. In patients with known breast carcinoma who are discovered to have a single hot area in the spine on bone scan, the panel recommends radiography of the hot area. If radiography is negative, the panel recommends MRI. For lesion localization and needle guidance, a CT scan is recommended if a needle biopsy is warranted. The panel recommends adding SPECT imaging if the planar radionuclide bone scan is equivocal. In patients discovered to have multiple hot lesions in the spine, the panel recommends radiography of the hot lesions; MRI is also recommended if the radiographic examination is negative. A CT scan becomes necessary if a needle biopsy is to be performed.

For a hot lesion of the sternum in a patient with known breast carcinoma, the panel recommends radiography, followed by CT, to help in the diagnosis and for localization if fine needle aspiration or core biopsy is required.

In a patient with known metastatic carcinoma presenting with a pathological fracture of a long bone on radiography, the panel recommends a radionuclide bone scan to look for other metastatic sites in the skeleton.

Recent studies have shown that for staging and follow-up of patients with prostate carcinoma, radionuclide bone scans are not necessary unless the PSA is greater than or equal to 20 ng/mL or the primary tumor is poorly differentiated. For routine staging purposes (no bone pain), the panel agrees with these studies. For patients discovered to have a well- or moderately differentiated prostate carcinoma and a PSA less than 20 ng/mL, it does not recommend any imaging studies for the skeletal system. The panel, however, recommends a radionuclide

bone scan for patients with a PSA greater than or equal to 20 ng/mL or a poorly differentiated primary tumor.

In patients with non-small cell carcinoma of the lung, bone is one of the most common sites for early extrathoracic spread. Some of these bony metastases could be asymptomatic. The exclusion of bone metastases is important in the initial preoperative staging of lung cancer, although it is not clear from the literature whether bone scans should be performed routinely or only when clinical indicators suggest skeletal metastases. The panel currently recommends a radionuclide bone scan of the skeleton in patients coming for staging after needle biopsy of a lung nodule revealed a non-small cell carcinoma. However, in patients with non-small cell carcinoma of the lung who have received or will be receiving an 18FDG PET study as part of their initial work-up, a radionuclide bone scan is not necessary.

Bone metastases are very uncommon at initial presentation in patients with primary malignant bone tumors; therefore radionuclide bone scan is not indicated. Bone scanning was shown not to be useful in differentiating between benign and malignant lesions or in defining the local extent of a malignant tumor reliably. Osteosarcoma is probably the only exception; although the yield of imaging for metastases at the time of diagnosis is small, the presence of an occasional metastasis could substantially affect the treatment of the patient. The panel concurs with these reports and it recommends a radionuclide bone scan for patients with osteosarcoma at presentation for staging. In patients with osteosarcoma who received adjuvant chemotherapy, 16% may develop asymptomatic osseous metastasis before lung metastasis; therefore some authors suggest bone scans for routine follow-up. The panel concurs with these reports and it recommends a radionuclide bone scan for patients with osteosarcoma at follow-up and after tumor resection with clear margins and chemotherapy.

In patients with cancers that rarely metastasize to bone such as cervical, endometrial, bladder, and gastrointestinal tract tumors, baseline scans are obtained only when the disease is advanced. There is no consensus in the literature about the timing of follow-up scans in asymptomatic patients. Some authors suggest a bone scan every 6 months for 1 year and then every 2 years. In clinical practice, most medical and radiation oncologists request follow-up bone scans only (a) in asymptomatic patients with evidence of progressive disease (i.e., rising carcinoembryonic antigen or alkaline phosphatase values) (b) for restaging the disease in patients with local recurrence, and (c) in patients with symptoms that are potentially of osseous origin.

Radiography is frequently used to screen for metastatic sites in multiple myeloma and Langerhans cell histiocytosis (histiocytosis X), but generally it is considered insensitive to screen for asymptomatic metastases. In patients with multiple myeloma who present with acute low-back pain, the panel recommends radiographs of the lumbosacral spine or bone survey if the interval since the last bone survey is long. Most of the panel also believes that MRI is probably not indicated in this clinical situation unless the patient has neurological findings. The panel believed that the only time where radionuclide bone scan (with or without SPECT) would be needed in cases of multiple myeloma is when strontium 89 treatment is being considered.

The vertebral column deserves special consideration. It is the most common site of skeletal metastasis, and cord compression from metastasis is among the most dreaded complications of cancer. MRI has proven advantages over all other imaging modalities, including myelography and CT myelography. One limitation of MRI has been its inability to differentiate an acute traumatic or acute osteopenic compression fracture from a pathologic fracture. Recently, diffusion-weighted MRI has been shown to be effective in differentiating benign osteopenic vertebral collapse from malignant collapse, but the efficacy of this technique is still controversial. The role of 18FDG PET and 18FDG PET/CT has been assessed in metastatic disease of the spine. In patients with lung cancer, studies have shown that 18FDG has better specificity than Tc99m MDP bone scan, but similar sensitivity for detecting osseous metastatic disease. Additionally, 18FDG PET/CT has better specificity for detecting metastatic involvement of the spine than 18FDG PET. 18FDG PET/CT allows precise localization of bone lesions and associated soft-tissue involvement with potential neurologic significance.

As MRI sequences continue to become faster, there is emerging evidence showing that whole-body MRI, using a rolling table platform, is feasible and it can replace bone scintigraphy for the detection of metastatic bone disease. Proponents of this technique indicate that whole-body MRI is more sensitive and more specific than bone scintigraphy. In addition to bone metastases, whole body MRI can demonstrate silent metastases in the brain, lungs, and liver. Whole-body MRI is also comparable in cost to bone scintigraphy. No ionizing radiation is involved with whole-body MRI, making it especially suited for pregnant patients with suspected bony metastasis.

Depending on whether the lesion is lytic, blastic, or associated with a soft tissue mass, fine needle aspiration or core biopsy can be used to arrive at a definitive diagnosis in patients suspected with metastasis of known or unknown origin. Needle biopsy is also helpful in suspected tumor recurrence and also to differentiate metastasis from osteonecrosis in previously irradiated bone.

Abbreviations

- CT, computed tomography
- MRI, magnetic resonance imaging
- NUC, nuclear medicine
- PSA, prostate specific antigen
- SPECT, single photon emission computed tomography
- STIR, short tau inversion recovery
- US, ultrasound

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate selection of radiologic exam procedures to evaluate metastatic bone disease

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists, and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

El-Khoury GY, Bennett DL, Dalinka MK, Daffner RH, DeSmet AA, Kneeland JB, Manaster BJ, Morrison WB, Pavlov H, Rubin DA, Schneider R, Steinbach LS, Weissman BN, Haralson RH III, Expert Panel on Musculoskeletal Imaging. Metastatic bone disease. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 11 p. [40 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1995 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria®.

GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Musculoskeletal Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: George Y. El-Khoury, MD; D. Lee Bennett, MD; Murray K. Dalinka, MD; Richard H. Daffner, MD; Arthur A. De Smet, MD; John B. Kneeland, MD; B.J. Manaster, MD, PhD; William B. Morrison, MD; Helene Pavlov, MD; David A. Rubin, MD; Robert Schneider, MD; Lynne S. Steinbach, MD; Barbara N. Weissman, MD; Robert H. Haralson III, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: el-Khoury GY, Dalinka MK, Alazraki N, Berquist TH, Daffner RH, DeSmet AA, Goergen TG, Keats TE, Manaster BJ, Newberg A, Pavlov H, Haralson RH, McCabe JB, Sartoris D. Metastatic bone disease. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):283-93.

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

ACR Appropriateness Criteria® Anytime, Anywhere™ (PDA application). Available from the ACR Web site.

Print copies: Available from the American College of Radiology, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable Document Format (PDF) from the American College of Radiology (ACR) Web site.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on May 6, 2001. The information was verified by the guideline developer as of June 29, 2001. This NGC summary was updated by ECRI on January 30, 2006.

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